ANNUAL REPORT OF THE CHIEF ENGINEER
FOR THE YEAR ENDING DECEMBER 1938.

TO THE JOINT BOARD,
INTER COUNTY RIVER IMPROVEMENT COMMISSION,
KING AND PIERCE COUNTIES, WASHINGTON.

GENTLEMEN:

The Inter-County River Improvement was founded and work started thereon just one-quarter century ago. At this time it behooves us to review the accomplishments and weigh the results of those 25 years.

After straightening the channel between the town of Puyallup and the city limits of Tacoma the major effort throughout the whole history of the Improvement has been the construction of bank stabilization and its maintenance. The type of revetment accepted as satisfactory on the banks of the Puyallup River to-day has developed through a process of evolution. Various type of revetment have been tried out, some adopted as satisfactory and some abandoned after varying ranges of use.

Although Mr. Thomson did not come onto this work until after it had been in progress some four or five years, and has not been on it constantly, he thinks we should keep in mind the origin of this work, and the fact those undertaking it, had no data on which to build. Therefore, in detailing any failure made in bank stabilization plans, we do not do so to in any wise discredit those who were trying them out. They were following a rather blind trail.

For a moment let us review the causes leading to the demand for this work. Prior to the late November in 1906, the White and Puyallup rivers wound their respective ways to their discharges into the Sound. The White discharging at Seattle, the Puyallup at

Tacoma. As seen by the early pioneers the White after issuing from its canyon about three miles south of Auburn, then turned sharply to the north, a rather straggling stream, passing through Auburn as two, three or four streams depending upon the stage of the river, then in another half mile joined the Green. However, at all times a small section of the White, say about five per cent, broke away from the main flow about one and a half miles above the point where the main river turned north. This small section or branch which the Indians called the "Stuck" hung close to the south line of the valley and continuing west about two and one-half miles entered a peat swamp of about 1200 acres. It wound its way through and south of the swamp and entered the Puyallup more than a mile below Sumner.

During a Chinook in November 1906, the flood waters of the White carried such a mass of drift that in attempting to make the sharp turn to the north in the White, it closed the mouth of the White with drift- something of a lake was formed in the White for a while, above this jam, this lake broke a channel over to the Stuck, and then the united stream followed its mad course to a junction with the Puyallup a little below Sumner. In making its channel down to the Puyallup, this joint stream carried so much silt that it buried as much as 1000 acres of the peat swamp from one to five feet deep, and wrought great damage all along the Puyallup down to Tacoma. Great controversy raged. Neither county wanted the river. King County, following the decision of geologists claimed the shift of water from King to Pierce County was an act of nature. Pierce County then denied, and still denies this. However, the river was in Pierce County, and the question was, what shall be done with it.

Finally, following the Act of the Legislature, passed in 1913, on January 19th, 1914, the counties entered into a contract to perpetually control the waters of White River so that it would

continue to flow to the sea through the Puyallup, and to that end "bank protection should be so strengthened as to permanently confine the waters to the channel and prevent inundation of adjoining lands."

The attempt to perform economically and if possible permanently, at small cost, are the plans which have been tried and rejected.

As said above, those to whom this work was committed, were compelled to follow a blind trail. They had no data to use, no precedents to follow, no knowledge, other than by guess, as to the number of cubic feet of water per second would have to be cared for, and so on- it was therefore largely a cut and try proposition with them.

In the prosecution of the work King County was obligated to pay sixty per cent of the cost, and Pierce County forty per cent.

At the very beginning little thought was given to the difficulties which would arise for "stregthening the banks and preventing inundation." However, the flood of 1906 had made entirely new banks from above Auburn to below Sumner. The Puyallup being very crooked, the Commission determined to straighten it . To accomplish this a dredge was constructed, and many cut-offs made. This shortened the length of the Puyallup from its original length by 7.61 miles, to a length of but 5.97 miles . Whilst this cut 1.64 miles out of the river and straightened its course, it also left materially the entire length of stream from Auburn to Tacoma, with new, or as they were called "raw banks."

The old river banks had been developed through many years certainly through centuries of time, and by long saturation and with impregnation with clay and silt, had, like we find the beds of old streams, become fairly well stabilized. These new or raw banks, however, were composed of open and loose earth, and were quickly cut by the current of the river, and it became evident that unless

at once protected in some way the new state of the rivers would be far worse than the original. Therefore, the cry arose:- "revetment." At once, there was an attempt made to cover those parts which were badly washing, with concrete slabs for revetment. Other methods of bank protection than by concrete slabs were applied in various sections. All revetments, however, were spoken of as either "permanent" which was the title applied to the concrete, or as "test revetment."

CONCRETE REVETMENT. The most common form of revetment is a concrete slab about five inches thick and laid upon prepared slopes which vary from 1 on 1 to 1 on 1.7. The aggregate for this concrete was always taken from the river bars. The treacherous point of this design was found to be invariably located at the toe of the concrete slope and a great number of different kinds of toe construction have been tried out by the different engineers on the river. One of the first types was a mattress made of boards 1" x 4" - 10 or 12 feet long laid at right angles to the flow of the stream and bound together with cable or wire or in some instances nailed to mud sills. This type was abandoned early in the work. Another type was composed of a series of terraces extending from the toe of the concrete slab well out into the river paved with sack rip rap. This type proved too expensive and unstable in the steeper reaches of the river. Another type consists of concrete blocks varying in dimension up to a block five feet square and twelve inches thick. These toe blocks were cast in place in rows extending from the toe of the concrete slab out into the channel eight to sixteen feet. They were laced together with heavy cables some as much as 1½ inches in diameter, running through the blocks parallel to the direction of the stream and cast in place. This type was used very little due, no doubt, to its extremely high cost and the fact that installation could be made only in the lowest stages of water.

The most popular toe protection used and the one which exists now on probably not less than 90% of all the concrete revetment intact, consists of a brush mattress twenty-five to thirty feet wide and extending as a continuously woven fabric longitudinally with the thread of the stream. This mattress was composed of fir trees woven together with heavy wire rope running with the stream; or at times poles were substituted for the wire rope. The knotting and tieing of the whole was made with No. 10 black annealed wire. The wire corrodes through and loosens the mat in a few years and from then on its deterioration is fast, ultimately becoming a mass of poles waving in the current and working the support of the concrete loose at the toe- the critical point of its support.

There exists to-day on the banks of the river 19.32 miles of concrete revetment. 6.43 miles of this is replacement or in other words about one-third of all the concrete revetment that has been constructed on the banks of the river has had to be rebuilt because of failure. No concrete revetment has been constructed on the river since the summer of 1934. The average life of the revetment in place now has been about ten years. Before we began the use of rock as protection, the added expectancy appeared to be about five years, making a total useful life of concrete placed with a brush mat at the toe of about fifteen years.

BULKHEADS. Another type of bank protection which has been used to a great extent upon the river is designated as bulkheads. This system developed during the early stages of the improvement while the river was being straightened by cut-offs. Where the new channel connected with the old channel it was necessary temporarily to bulkhead the old channel off and this was done by driving rows of piling across the channel to be bulkheaded. Thus we get the name bulkhead. This system was continued at various places on the river as bank protection by driving a double row of piling and filling with fir brush. The brush had to be renewed from time to time, was an extreme fire hazard during dry weather, provided none too good bank protection and in addition had a very short life. Prior to

1914 about two miles of this type of river control had been constructed on the Puyallup and Stuck Rivers and was at that time intact. From 1914 up to 1932, 6.9 miles of bulkheads were constructed at various places throughout the length of the Inter-County jurisdiction. The sum of the above two items is 8.9 miles of bulkheads. To-day there is intact upon the banks of the river 3.22 miles of bulkheads. The average remaining life of these is possibly about five years, most of them being in a serious state of decay. With a knowledge of these historical facts your present engineers have abandoned entirely the use of pile bulkheads as bank protection.

BRUSH MATTRESS AS REVETMENT. A number of other types of bank protection have been experimented with to a small degree for the purpose of determining there applicability to this project. Various types of brush mattresses woven and anchored to the bank have been tried out. The short life of the brush and lack of flexibility in adapting itself to changes in bank by reason of scour, its susceptability to fire and other reasons have caused us to abandon it as a useful method of bank stabilization. Considering its extreme short life as against its original cost, the annual cost per lineal unit of bank it shows extremely high as compared to almost any other method of bank stabilization.

RETARDS AND CRIBS. One of the favorite methods of bank protection used a few years ago on this project was brush retards and log cribs. These structures were built into the stream in the form of jetties off of the bank to be protected, and while they serve as temporary protection for a short time the experience during the flood of the winter of 1933 and '34 proved them unsatisfactory. At that time a great number of such structures were left standing in the middle of the stream when the river washed behind them and the resultant effect was far more damaging than had there been nothing there at all.

TETRAHEDRONS AND ROLLED WIRE. Upon a short stretch of bank opposite the Inter-County shop a test was made by the use of

pre-cast concrete tetrahedrons. The test use of tetrahedrons was determined upon after the receipt of pamphlets sent out from the United States Laboratory of Flood Control at Vicksburg, Mississippi. Also in conjunction therewith there was tried for bank protection a form of retards built of coiled chicken wire which was given us by the game farm. Recent high waters have shown both of these methods to be unsatisfactory, at least on a stream with a gradient as steep as the location experimented upon.

TOE PROTECTION. When your present engineers took office in the spring of 1933 they found the one great problem which was giving trouble to the retiring engineers to be the failure of the concrete revetment due to the decay of the brush mattress which had been adopted almost universally as toe protection, and to the undercutting caused by the swifter current alongside, due to the smooth face of the concrete itself. It was stated no satisfactory answer had been found. Your engineers made a thorough study of the whole situation and by June were ready to and did report, in a written document, to the Joint Board, that, in addition to this problem which we too considered of extreme importance, there were three other major items which must be answered correctly to obtain successful operation of the project. One being the hazard of great quantities of extremely large drift, another the accumulation of gravel in that stretch of the river between the Stewart Bridge and Northern Pacific Railroad Bridge and 1st, the most important of all, the fact that the channel, even the improved channel, had been constructed too small to take care of regularly recurring major floods. As you know we determined that the answer which would relieve all of these conditions to be the construction of a retarding dam at Mud Mountain. In addition we recommended that the possibility and cost of rock be investigated.

ROCK. During December 1934 upon our recommendation the first rock was placed upon the river at the Auburn Wall. A quarry was purchased at Veasie, was developed and about 4,000

cubic yards of rock hauled from there and distributed along the toe of the gravel slope under the Auburn Wall. Nature's test upon this work indicated that it was entirely satisfactory and tended to prove to your engineers that the concrete revetment in the lower reaches of the river could be saved and its life extended indefinately as the result of heavily loading the toe of the revetment blocks with proper rip rap, if a quarry could be found not too far from the lower river. Accordingly after a thorough investigation of the district and in cooperation with the Army Engineers, which organization was fast becoming the federal organization for the direction of flood control work, we selected a quarry south of Orting on the Orting-Kapowsin Highway. As part of a W P A project, then set up, about 40,000 yards of rock was produced and hauled from this quarry and distributed along the river at the most necessary places. Since then the Inter-County organization has hauled about 20,000 yards of rock and we believe that with these 60,000 cubic yards of rock we have removed all immediate hazard of serious damage to river banks or revetment which would occur in a flood not so great as to overtop the banks or levies.

While this rock was of extremely fine quality, being massive in form and of high specific gravity, a great amount of waste developed in the quarry due to the over-burden and the weathered condition of the upper strata; nevertheless, your engineers considered the problem of proving rock to be the adequate answer, of such extreme importance that they felt justified in insisting upon the continuation of that first W P A project even after the condemnation of the quarry by the Army Engineers. The results obtained since then lead us to feel entirely justified in the extremely insistant position we took at that time. Under that project, rock cost $2.08 per cubic yard on the river bank. This cost included all the development, handling and disposal of waste, production of the rock and hauling to the river bank. While we have had no major floods since the placing of this rock we have had sufficiently high water to satisfy ourselves that it will not move under a major flood

and that it will accomplish in a most satisfactory manner the purpose intended.

Since the original W P A project which developed the quarry at Orting, we have operated either entirely out of Inter-County funds or at times in cooperation with Pierce County. Due to the great amount of waste necessary to handle, the cost of the rock has increased somewhat as we proceeded. During the first six months of the year just past, we hauled from the quarry about 12,000 cubic yards of rock at a cost of $2.33 per cubic yard on the river bank. At this time there is completed along the improved channel 27,480 feet or 5.21 miles of toe groins. These are small groins consisting of about twenty cubic yards of rock each extending from above the toe of the concrete into and down stream and spaced at approximately thirty feet centers. They function perfectly in preventing scour at the toe of the concrete and build in silt between the groins to support this toe. In addition to these groins we have protected 18,300 feet or 3.46 miles of raw bank, mostly in the Dieringer, County Line and Auburn Sections by the use of blanket rip rap or the construction of long groins or jetties.

RIVER BOULDERS AS GUIDE TO RIP RAP SIZE. Your Chief Engineer during the past year has made a study of the size of rock which a stream will move as determined by the gradient of the stream, its depth and the consequent velocity. The study of the maximum size boulder found in river beds and analyzed with due consideration to the gradient of the stream, the specific gravity of the boulder, and the local geology have enabled him to determine a definate rule as to the size of rip rap which will be stable at any particular point in the river.

While a portion of the rock placed on the lower reaches of the Puyallup may at first appearance seem of too small aize, this study together with natural tests made in the river warrant its use. However, as we follow up all these mountain streams the slope of the river steepens and it is found in the White in the neighborhood of the Auburn Wall and just below it, that it is necessary to use

rock which has a minimum dimension of not less than three feet, in order to have a proper factor of safety. A similar gradient exists on the upper reaches of the Carbon and Puyallup Rivers which are being protected at this time.

The very evident increasing cost of the operation of the quarry at Orting led your engineers to start seeking a new location for a quarry somewhat more than a year ago. At the suggestion of Mr. Lester Corey we looked at a location back of the Soldier's Home at Orting, which has since been purchased and developed by Pierce County. We could not grow enthusiastic about this location for several reasons. First, it required the construction of a considerable amount of new road. The rock faces formed the walls of a narrow canyon with little room to dispose of waste which will become an increasing problem as the development work proceeds. The rock is a porphoritic andesite standing in columnar crystals over-hanging the working floor of the quarry and of a very low specific gravity, weighing only 154 lbs. per cubic foot as against 173 lbs. which the blue basalt in the other quarry weighs. However, a large part of the quarry is sound rock and will stand weathering extremely well and should be entirely satisfactory as bank protection in those reaches of the river where the slope is not too great. Upon the Inter-County jurisdiction this rock will be satisfactory on all that portion of the stream from the neighborhood of the Stewart road bridge down. Above that point the Inter-County can haul rock from its Veasie quarry more economically than from the Orting location. The chief trouble with this rock for the reaches of the river with steep gradients is the fact that so much of it comes out in the form of long logs or slabs of rectangular, hexagonal or octagonal cross sections with a mimimum dimension ranging from fifteen to twenty inches; and, it is the minimum dimension of the pieces of rock in water which determines its stability or lack of stability.

While the operation of this quarry to date has been quite successful its development has not removed the fears that

we originally formed. In fact it appears now that as the development preceeds the waste problem will become more and more of a burden exceeding what we originally anticipated. It is reported to me that rock is being produced in the quarry at a cost of $.526 per cubic yard; that it costs $.34 a yard to load and $.98 a yard to haul it to a point on the Puyallup River a mean distance of 8.6 miles or 11.4 cents per cubic yard mile. This make a total cost of $1.85 per cubic yard to put the rock on the river bank.

A comparison of costs in the two quarries is shown below. The figures under column headed " Inter-County" are the costs obtained in the Inter-County quarry during the last six months of its operation, when a total of 13,252 cubic yards were produced. Under the column headed " County" are the results of the first five months of operation of the Pierce County quarry, when a total of 13,429 cubic yards were produced.

	Inter-County	Pierce County
Quarrying	.740	.526
Loading	.500	.340
Hauling	1.090	.980
Totals	2.33	1.946
On River Bank Hauling per cu. yd. mile	.068	.114

Upon the showing above and in cooperation with Pierce County from the new quarry the Inter-County River Improvement should be able to put rock on the river about as follows.

Quarrying	.526 per cubic yard
Loading	.340 " " "
Hauling	1.09 " " "
Or a total on the river bank	$1.956 " " "

The Pierce County quarry was developed and operated by the Inter-County River Improvement superintendent, Mr. Floyd Rogers, under a working agreement between the Inter-County and Pierce County, whereby we rented to the county not only services of Mr. Rogers, but also all of the quarry equipment including the compressor, jack hammers, drills, pipe, blasting machine and such other small equipment as was necessary to operate the quarry. The rental of this equipment was agreed upon at $150.00 per month, which together with the salary of Mr. Rogers is to paid for and returned to the Inter-County in the form of rock loaded on our trucks at actual cost. Pierce County now owes the Inter-County $2,616.02 worth of rock for these services plus 600 cubic yards of rock as a balance carried over from the operation of last spring. The following statement was handed Mr. White showing status as of January 3, 1939.

Amount of rock due Inter-County previous to July 1st, 1939 from Pierce County as per resolution No. 441½		600 cu.yd.
July 1st 1938 to December 31st 1938 Superintendent & Equipment		
Mr. Rogers salary 6 months @ $225.00 per month	$1350.00	
Ind. Ins. & Med. Aid for same period on above	37.22	
JE Murray 4 days-Dec. 27-28-29-30 @ $7.20	28.80	
Equipment Rental as per resolution No. 441½ Period of six months @ $150.00 per month	900.00	
	$ 2,316.02	
Cost of loading and quarrying as per report 2316.02 divided by .866 equals	$0.866	2670 cu.yd.
Total cubic yards due Inter-County Jan. 3, 1939		3270 " "

By and large we believe the new quarry to be an improvement over the old quarry and recommend that the Inter-County not only collect upon the rock which is now owing it but that the two organizations continue to cooperate upon a 50-50 basis and, if it is possible for Pierce County to do so, that a program be set up whereby the quarry can be operated continuously throughout the coming year. We believe that even should this work be done in combination with W P A projects the operation of the quarry should be kept entirely independent and under the control of the county organization and that the fair basis upon which to operate would be for Pierce County and the Inter-County River Improvement to pro-rate the cost of quarrying and loading the rock in proportion to the quantity that each takes. The hauling can be done as independent and separate units.

CHANNEL CLEARING. Channel clearing has been kept in mind as one of the major functions of our work. Accordingly during the past year a W P A project was applied for and approved. The major feature in this project was channel clearing. All of the brush growing on the silt deposits over the concrete revetment throughout the improved reaches of the channel was cut, and cut close at the time of the year when willows are most susceptable to being killed by such cutting. The brush on the unprotected banks was also trimmed and cut in such a manner as to remove all of the larger growth and induce a finer growth which has proved to be the most satisfactory bank protection of this order. A crew of from 50 to 100 men was employed by W P A for this work and continued after completion of the brush cutting with the destruction of drift in the upper reaches of the river, that is above the Northern Pacific bridge and extending upstream to the old drift barrier. In conjunction with this work the Inter-County crew was employed during the last three months of the year in the Muckelshoot section, that reach of the river above the Auburn Wall as far as the drift barrier. With the aid of a Fordson

donkey engine the large logs, trees and stumps were dragged from the bed of the river and placed on the curves and at mouths of old channels upon the left bank in such a manner as to form a protection upon this bank. This protection is required mainly for the water supply line of the town of Auburn, but however, the formation of these jams of old stumps and logs and trees in the curves of the river and the tieing of them in place with large cables will operate to form a series of drift catches or barriers throughout this reach of the river and will more successfully retain the river drift than the old barrier which was originally constructed, which has now been abandoned. With all of this work we believe that we have produced a greater carrying capacity throughout the length of our jurisdiction than has before existed in the river, in other words that a greater flood could occur than heretofore possible without over-topping the banks.

AUBURN SECTION CONTROL. For the past two years we have done no dredging at the high pole opposite the Inter-County shop. The few high waters during that period have not visibly raised the bed of the channel. We believe this is due in part to the system we have adopted in the Auburn Section or that reach of the river extending from the Northern Pacific Railroad Bridge to the Auburn Wall. Here the stream zigzags back and forth in a wide channel and instead of trying to confine it to a narrow straight channel as heretofore, we have permitted it to meander and in fact done considerable work to induce the stream to wind back and forth across the whole broad channel; protecting with rock those sharp curves where the stream strikes the shore and placing groins at other locations with the design intended to deflect the main channel across to the other side. This system flattens the slope of the gradient, reduces materially the amount of bank subject to erosion and unquestionably reduces the bed load carried by the stream. This bed load is the cause of all our trouble at the high pole and its deposition there unless prevented will ultimately fill the entire channel.

MUD MOUNTAIN DAM. While the U. S. Engineering Department did not let a contract for the construction of the dam at Mud Mountain this past year, material progress has been made. A good highway was completed from State Road No. 5 into the dam site. An Engineers construction camp of sufficient size to accomodate the forces of engineers required throughout the construction has been completed. A most exhaustive system of tunnels, drill holes, open cuts and ditches has been developed for the purpose of disclosing minute geological characteristics of the site.

A total of $1,800,000 has been made available by Congress for use on the project. About $400,000 has been expended. It is reported to the writer by the men in charge that the balance is being hald intact for the job. A contract was not let during the fall of 1938 for the reason as stated to me by the Division Engineer, Colonel John C. H. Lee, that the Chief of the Army Engineers thought no material progress would be made by trying to work on the project during the coming winter. It is planned definately to call for bids and let a contract on the whole job in the spring of 1939.

Your Engineers have worked closely with the U S Engineering Department throughout the past year in formulating final plans and specifications for the job. While it is not at this time settled as to who will have final jurisdiction of the operation and maintenance of the project we have assumed the Inter-County River Improvement may be responsible and have accordingly criticized and suggested to the intent that the final plan of the project would give the greatest protection to the lives and property under it, always keeping in mind that the design should be so planned to reduce the items of operation and maintenance to the least reasonable minimum.

At the request of the federal government all rights of way were deeded to the United States in the early part of the year without consideration other than the stipulation that they

should revert to the counties in case the project were not constructed within five years. Provision was made by Congress that we, as sponsor, should be reimbursed for the actual reasonable outlay made upon these rights of way. Claims have been filed with the District Office of the Army Engineer, one in the name of each county and in the amount actually expended by each for that purpose. In as much as the Chief of the U S Army Engineers has stated that they are without funds at this time to pay the claims we have not insisted thereon, but recommend that such steps as are necessary be taken to keep them alive.

These conditions create a situation that leaves both the Army Engineers and your Engineers in the dark as to which department will be finally responsible for the operation and maintenance of the project. Nevertheless, in view of the resolution passed by this Board agreeing to assume control of operation and maintenance your Engineers have taken the position that such probability required our closest scrutiny of the work done and full cooperation with the Engineering Department. We are happy to report that we have maintained a very cordial and intimate association with the men who are responsible for the design of this project, that we have been called upon to advise and criticize various plans and details of plans under consideration and that we have made it one of the major efforts during the year to do what we could to procure the most satisfactory design for the location. We are assured by the men in charge that the project contract will be let at an early date and we believe that the plan which has now been worked out will secure for this district a dam with a factor of safety as high or higher than any other similar project ever before built.

COORDINATION OF TRIBUTARIES. The close association of your Engineers with the U. S. Engineers, who have charge of all flood control work for the federal government and whose program

now calls for the expenditure of vast sums of money, has led us to make a study of such streams as are tributary to either the White or Puyallup River.

For instance it was once suggested by one of the Army Engineers working on the design of Mud Mountain dam that by lowering said dam slightly, the cost of construction might be reduced somewhat, and any loss of storage could be compensated for by the construction of a low cost dam on the Carbon River between Fairfax and Carbonado. We investigated this site and found it to be an ideal dam site but of no value for flood control for the reason that too small a storage could be obtained above the dam. We then inspected the full length of the river and as a result found a site which we believe is worthy of further investigation. This site on the Carbon River, is near the center line of the NW¼ of Section 31, T 19N, R 6 E., W.M. It appears that at this point a dam from 200 to 250 feet high could be constructed to control the great floods of the Carbon River, thus reducing the resultant damages of these floods, not only upon the upper Puyallup, but upon the river under our jurisdiction. We recommend that the federal government be requested to make a survey and report upon this suggested project and that at the same time similar possibilities for the upper Puyallup above Orting be investigated.

The lower Puyallup River which was not included in the Inter-County River Improvement jurisdiction at the time of its organization, for the reason that it lies within the city limits of Tacoma and was considered to be a problem for the city government, has never been improved and remains to-day a serious flood problem in this community. In 1936 the District Office of the Army Engineers designed a plan for the improvement of this channel and as a project it was approved by Congress and money made available for its construction. A local contribution was demanded amounting to somewhat over $800,000 and it appeared that this

has been the stumbling block which prevented any progress. We believe that the problem of the control of floods on the Puyallup River will never be properly answered until that stretch of the river through which we must empty our floods into the bay has been properly constructed in permanent form with a channel of sufficient capacity to carry the floods. Accordingly we have been called upon to make some study of this situation, have discussed the matter in detail with the Engineers in the Portland office of the U. S. Engineering Department who are now developing a new plan. We believe this new plan will be found not only less expensive but entirely workable and with a local contribution within the reach of the city of Tacoma.

The Green River, while not now a tributary to ours, formerly was the channel for the White, and until the completion of Mud Mountain dam we can never feel sure that it will not again be called upon to carry the flood waters of what used to be its major tributary. It is so closely associated with our work that we have been called upon time and again in various capacities to study and discuss some of its problems. The Army Engineers are now surveying and developing a comprehensive plan of flood control upon this stream. It was recently stated to your Chief Engineer by Colonel Wild, who is in charge of that work that he believed it highly desirable that a plan be developed upon this stream which could be approved not only by the federal government for the expenditure of federal funds but also by the County Commissioners for the expenditure of County funds. In other words that a plan be set up upon which both King County and the federal government could cooperate so that the great annual expenditure by King County could be made toward a program of a comprehensive and permanent flood control system.

With this in view we recommend to the King County members of this Board that you assign an engineer to cooperate with and help develop this plan with the intent that you may

intelligently give approval to it when finally worked out.

The past few years we have seen vast sums of money expended on flood control projects in our two counties. During the coming year we are bound to see greater sums of money, particularly federal funds, expended upon flood control projects here. We believe that plans have crystalized now so that these great sums can be spent in an intelligent and lasting manner and not in boon-doggling fashion which some persons complain has marked much of the W P A flood control work. We are satisfied that it is the desire of the U S Army Engineering Department from its top down, to get away from this relief controlled work as fast as possible and organize its projects upon a sound and permanent basis. Its organization will be in charge of the expenditure of vast sums this coming year and thereafter. We recommend that you instruct your engineers to cooperate to the fullest extent with this organization that their efforts may thereby produce the best results.

LAW SUITS. Two law suits are still pending against the counties. In the case of L. J. Dowell of Seattle, Washington, VS King County and Pierce County the matter has been again set for trial about the middle of February. The damages sought in this case amounts to $10,000. It has been postponed from time to time at the request of plaintiff and while there is no assurance now that we will actually get to trial we find it necessary to make preparation to defend the case.

The other case pending is in the matter of Short VS the two counties. This case was tried once in the Superior Court of Pierce County and after hearing all the evidence of the plaintiff the Court sustained the motion by the counsel for defense for a non-suit. The plaintiff then appealed the case to the Supreme Court which ordered a re-trial. However, the Supreme Court laid down the law in the case in a clear and concise manner, and so limited the probable damages for which the plaintiff may collect that it would appear of little use for him to further prosecute

the case. Nevertheless, it has been kept alive in the Superior Court of Pierce County but has not been set for re-trial.

WEATHER. The weather for the month of December was about normal. The precipitation for the month as recorded at Buckley was 4.35 inches which is somewhat lower than normal and which was scattered pretty well throughout the whole month. No snow was recorded. Altogether the weather throughout the year 1938 was favorable for construction work. There was an unusually low amount of rainfall recorded. No serious floods or very high waters occurred throughout the whole year.

The financial statement for the year is submitted herewith. It shows that while we exhausted our annual budget in each county we still have a substantial cash balance with both treasurers.

Respectfully submitted,

B.P.Thomas, Chief Engineer,
Inter-County River Improvement

R. H. Thomson, Consulting Engineer
Inter-County River Improvement.